Attachment A

Delta Levee Classifications

Land Use / Levee Use	Levee Class	Description / Design Basis	Basic Cost[a,b,c] ($ Million/mile)
Wetlands	W-1	Habitat and some agricultural (pasture, rice, some annual crops) that can tolerate flooding – e.g., Suisun Marsh, Yolo Bypass Interior, Cache Slough Area, Cosumnes Floodplain	0.3
Agricultural	A-1	HMP – for FEMA Disaster Assistance if a levee fails (unit cost for Delta upgrades in typical cases not yet HMP)	0.5
	A-2	PL 84-99 – Corps Delta-specific standard to qualify for Corps Emergency Levee Assistance and Rehabilitation (for new projects, include upgrades per DWR Bulletin 192-82 agricultural design)	1.0 to 2.0 Up to 3.5 with thick peat
Infra-structure	I-1 = A-1	HMP – for FEMA Disaster Assistance if a levee fails (unit cost for Delta upgrades in typical cases not yet HMP)	0.5
	I-2 = A-2 = U-1	PL 84-99 Corps non-seismic Delta standard (flood control, navigation, highways, railroads, pipelines, electrical and gas facilities), including Bulletin 192-82	1.0 to 2.0 Up to 3.5 with thick peat
	I-3 similar to U-5	Seismic (a) -Fail/Repair – Don't treat, or minimally treat, soft foundation and existing embankment; add mass to existing embankment so it doesn't slump to a below-water-line crest elevation and a platform will remain for repairs after an earthquake. (for through- Delta conveyance.)	16 to 25 Up to 28 for thick peat
		Seismic (b) – No Fail/Minimal Slump (State Water Contractors requirement for through Delta water conveyance)	16 to 29 Up to 65 for thick peat & loose sand
		Seismic (c) – Super Levee (use for a raised infrastructure corridor) – For a corridor across deep peat and loose sand, costs are much higher.	6 to 12 with little peat & loose sand
Urban[d]	U-1 = A-2/I-2	PL 84-99 – Corps Delta specific agricultural standard (pre-urban).	1.0 to2.0
	U-2	FEMA Flood Insurance Remapping – for removal from 100-year floodplain and release from flood insurance requirement. Provides protection from 100-year water level, with 3 feet of freeboard. Anticipated to require improved stability and seepage control compared to PL 84-99 or previous FEMA FIP.	4 to 10, depending on the amount of levee raise needed and other local conditions
	U-3	DWR 200-Year – FEMA FIP plus DWR Bulletin 192-82 urban enhancements and 200-year protection per state law.	Less than 1.0 extra over U-2
	U-4	Delta Towns – Class U-3 plus design features such as floodwalls or ring levees and, potentially, seismic protection and higher levels of flood protection. May need to address deep peat or loose sand.	Widely variable based on local conditions
	U-5 (sub-class (a) does not apply)	Seismic (b) – No Fail/Minimal Slump (treat soft foundation, provide new engineered embankment as setback levee)	16 to 20
		Seismic (c) – Super levee (good foundation, engineered embankment, wide crest, houses on levee crest; Bethel Islands "Coves Project" and Stewart Tract "River Islands Project").	6 to 12 with little peat & loose sand, levee heights of 10 to 20 feet, use of local borrow

[a]The basic cost for each type of levee indicated is based on cost estimates from the DRMS "Levees Optimization Group." It includes vegetation for ecosystem values, as practical and consistent with levee function. Each can be enhanced to incorporate additional ecosystem features such as benches, tidal zones, flood plain areas, and plantings at additional costs of up to $3 million per mile.

[b]Each type of levee can be built to moderately higher crest elevation (with no loss of structural stability) to allow for future sea level rise at an additional cost of approximately $0.2 million per mile for each additional foot of height. These costs would be less for Wetlands and HMP levees and more for Delta Towns and Seismic Super Levees.

[c]Each type of levee can have a variable design (such as a floodwall) at additional cost, if necessary due to special circumstances such as limited space.

[d]It is assumed that urban levees (except for "Delta Towns") are not applicable in the Primary Zone or with deep peat.